a land of extremes.

Alaska is the largest state—586,000 square miles. That's more that twice as big as Texas.

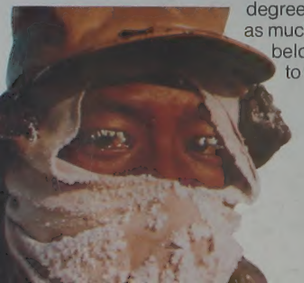
But it has the smallest population—330,000 persons. There are more high school students in New York City than there are citizens in Alaska.

Alaska has 34,000 miles of tidal shoreline—about 38% of the U.S. total. And the state has three million lakes of 20 acres or more, about 10,000 rivers and streams and the highest mountain peak in North America—Mount McKinley at 20,320 feet.

There are four time zones in Alaska.

Despite the enormity of the construction project, the finished pipeline will occupy only twelve square miles—and have a temporary impact on an additional 50 to 60 square miles during the building process.

Workers learned to perform under unusually difficult conditions—including sub-zero temperatures along much of the route. Extreme readings covered a range of about 170 degrees—from as much as 80 below zero (F) to 90 above.



Alaska is a land of extremes in other ways as well. Its winters are long and its summers quite short. In some parts of Alaska, the growing season can be less than two months long. Just a few weeks for plants to grow and bloom. But during these brief summers, the sun will stay up for 20 hours or more. This short, intensive growing season produces everything from delicate wildflowers to 70 pound cabbages.

?

1. How long does it take the oil to flow from the drilling site at Prudhoe Bay to the tanker loading docks at Valdez?
2. How fast does the oil flow through the pipeline?
3. What kind of pumps keep the oil moving?
4. How long is the pipeline?
5. When finished, how much space will the pipeline itself take?
6. Why doesn't the pipeline have to be heated to keep the oil flowing?
7. What sort of snowfall would you expect the oil fields at Prudhoe Bay to have?
8. Is Alaska bigger than France? Bigger than Spain? Bigger than England? Bigger than Italy?
9. How much oil do you, as an average individual, figure you use as energy and in petrochemicals?
10. When the pipeline is complete, how long will it have taken to plan, design and construct it?
11. The pipeline crosses three separate mountain ranges. How many rivers and streams do you think it crosses?
12. How many barrels of oil are the Prudhoe Bay fields estimated to contain?

i

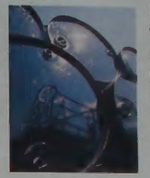
1. Four and one half days. **2.** Seven mph. **3.** Centrifugal pumps (powered by aircraft-type gas turbines) **4.** About 800 miles, roughly the distance from Chicago to Denver. **5.** Approx. twelve square miles. There are 586,000 square miles in Alaska. **6.** Because the oil comes out of the ground at about 180° F., and the friction of its passage through the pipe keeps it at about 135° F. **7.** Only six inches per year. It's actually an arctic desert. **8.** As a matter of fact, Alaska is larger than all of them combined. **9.** Three gallons; every single day. **10.** About ten years. **11.** Almost 600. **12.** 10,000,000,000 barrels.

Alyeska pipeline
SERVICE COMPANY

1835 South Bragaw Street, Anchorage, Alaska 99504

the trans Alaska pipeline.

the pipeline begins at home.



Each of us—every man, woman and child in America—uses three gallons of oil a day in the form of energy and in thousands of products based on petroleum and petrochemicals.

About one of every four gallons of the oil we need comes from foreign sources. One way to limit that dependence on others is to produce more oil at home.

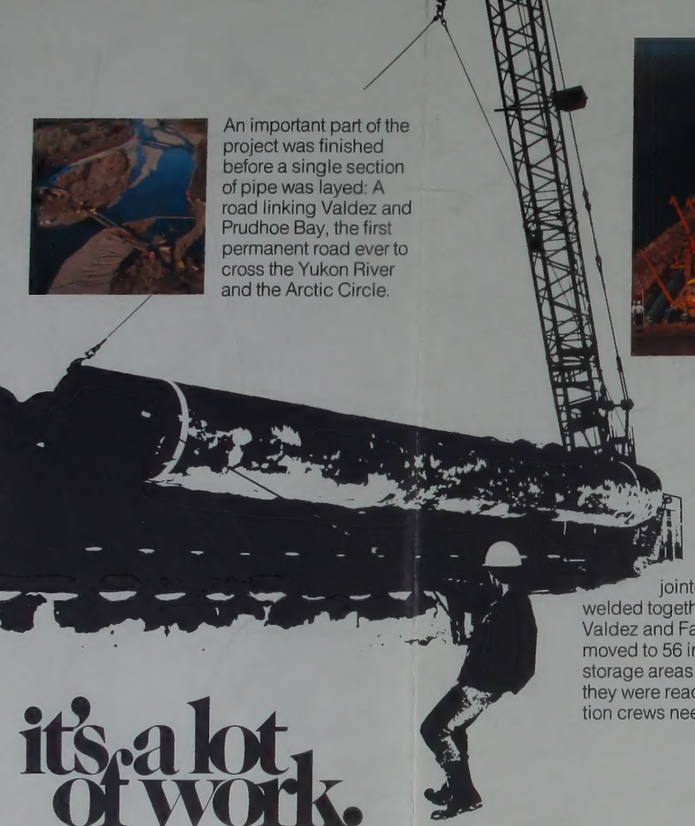
And that's what the trans Alaska pipeline is all about.

The Prudhoe Bay fields are estimated to have ten billion barrels—as much as Louisiana, Oklahoma, Kansas and half of Texas combined.

The best way to move that oil from the Arctic to the ice free port of Valdez, Alaska is by pipeline. In October, 1968, a group of oil companies* proposed to build that line.

*The following companies have formed the Alyeska Pipeline Service Company to design, construct, operate and maintain the trans Alaska pipeline: Amerada Hess Corporation, ARCO Pipe Line Company, SOHIO Pipe Line Company, Exxon Pipeline Company, Mobil Alaska Pipeline Company, Phillips Petroleum Company, Union Alaska Pipeline Company and BP Pipelines, Inc.

An important part of the project was finished before a single section of pipe was layed: A road linking Valdez and Prudhoe Bay, the first permanent road ever to cross the Yukon River and the Arctic Circle.



The 40-foot lengths of pipe were double-jointed (two lengths welded together) in shops at Valdez and Fairbanks, then moved to 56 intermediate pipe storage areas along the line so they were ready when construction crews needed them.

it's a lot of work.

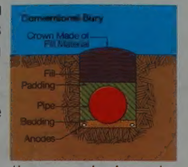
By the time the first ship is loaded with oil from the trans Alaska pipeline, almost a decade will have passed from the time when the original design group was formed. Ten years and over $6 billion.

At the time of peak employment, about 20,000 persons were at work on the line.

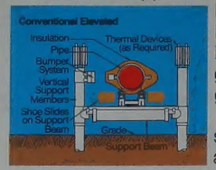
And by any measure of physical size, the job is among the largest ever, complicated by a brief fair weather construction season and some of the most rugged terrain in the world.

Highly skilled welders, working with special equipment and using special techniques, are assigned the job of creating a single, engineered structure from the more than 100,000 pieces of pipe required for the line.

Three construction modes were developed to meet varying environmental, terrain and soil conditions encountered along the line. The first mode is referred to as *conventional burial,* with the pipe placed underground at depths ranging from three to twelve feet. This mode is suitable in areas with stable soil, gravel or bedrock. About 400 miles of the line was designed for this installation.

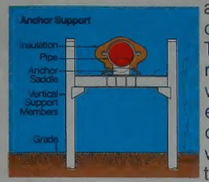


The other half of the line was designed for above ground installation. The pipe is mounted on supports 50 to 70 feet apart, and insulated with four inches of resin-impregnated fibrous glass jacketed with galvanized steel.



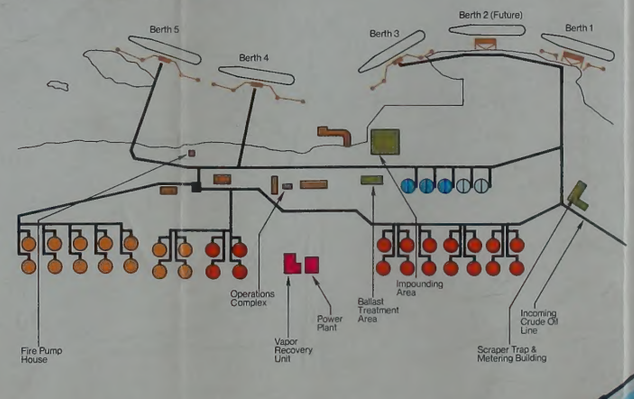
Several small sections of the line are buried and permanently frozen in the ground. Because oil comes from the ground as warm as 180 degrees (F) and maintains a 135 degree temperature through much of the line because of friction, the buried pipe is insulated and refrigerated in these few miles of ice-rich permafrost.

In those areas where the line is elevated over ice-rich permafrost, special thermal devices are used to keep the soil around support columns frozen. These are hollow metal tubes filled with a refrigerant that evaporates, condenses and cools whenever the ground temperature exceeds air temperatures. They are non-mechanical and self-operating.



The southern terminus of the pipeline at Valdez covers about 1000 acres. Each storage tank is 250 feet in diameter and 62 feet high with a capacity of 510,000 barrels of oil.

Valdez Terminal, Maximum Development



The trans Alaska pipeline is designed to deliver two million barrels of oil a day to the Valdez terminal at full capacity. If full, the line itself would hold about 9.04 million barrels of oil—about 11,300 barrels per mile. Operating at full capacity the system will move oil through the line at about seven miles an hour, so the trip from Prudhoe Bay to Valdez would take about four and a half days.

from the arctic to you.

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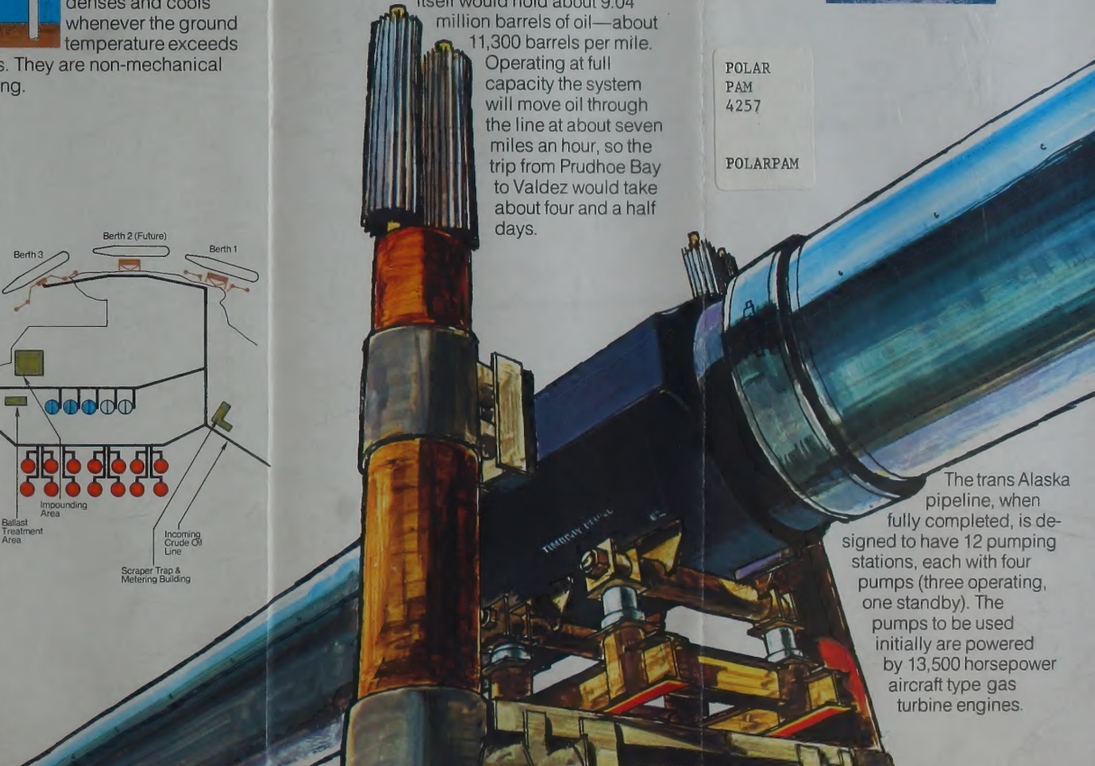
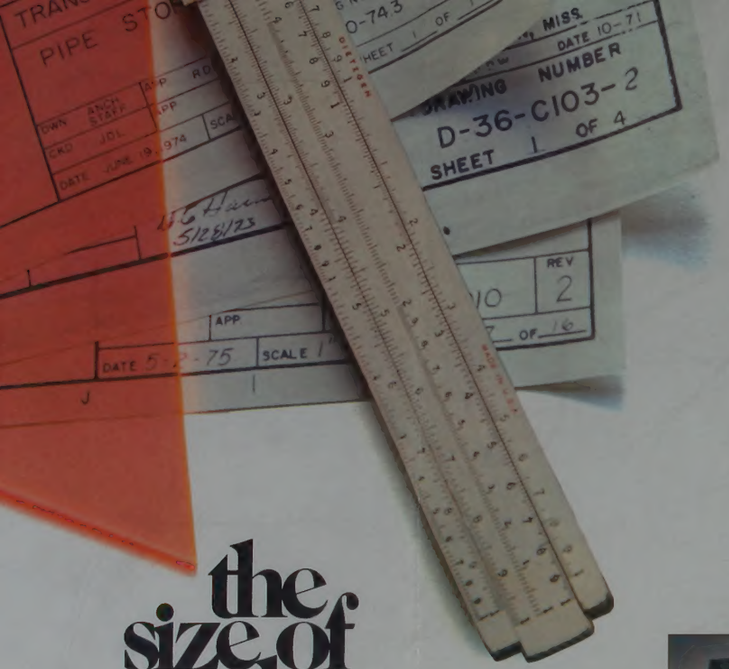
POLARPAM



The trans Alaska pipeline, when fully completed, is designed to have 12 pumping stations, each with four pumps (three operating, one standby). The pumps to be used initially are powered by 13,500 horsepower aircraft type gas turbine engines.



the size of the challenge.

The 800-mile trans Alaska pipeline is a monumental construction project—by far the largest ever financed by private capital.

And one of the most complicated.

The technological and logistics problems were enormous. The line crosses 600 rivers and streams, earthquake-prone areas and three mountain ranges.

The environmental challenges were unprecedented, and so were the measures taken to minimize the impact of the project. Environmental studies were initiated in 1968, years ahead of the first building permit, which was issued in 1974.

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Much of Alaska is rugged country with a harsh climate and difficult terrain.

But it is a fragile land in many respects, particularly vulnerable to construction activity.

For example, permafrost—permanently frozen rock or soil—may be covered with a delicate mat of vegetation called tundra which may be damaged easily when in a thawed state in summer. So special construction techniques were devised to protect such sensitive areas.

The wildlife of the region is the same: Tough enough to endure in the demanding natural environment but highly sensitive to the presence of man and machinery. Construction activity and the route itself were planned with the needs of the land and its wildlife among the primary considerations.

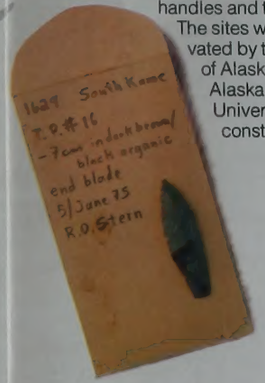
The entire route corridor was checked for environmental features, with specific studies in the fields of biology, botany, zoology, geology, seismology, archaeology, marine biology and oceanography.

do not disturb!

Studies of bird populations along the pipeline route identified more than 170 species, including the endangered peregrine falcon. The line was laid out to avoid nesting areas and crew work patterns adjusted to minimize disturbance to the animals. Other animal populations that were given special care included Dall sheep and caribou.

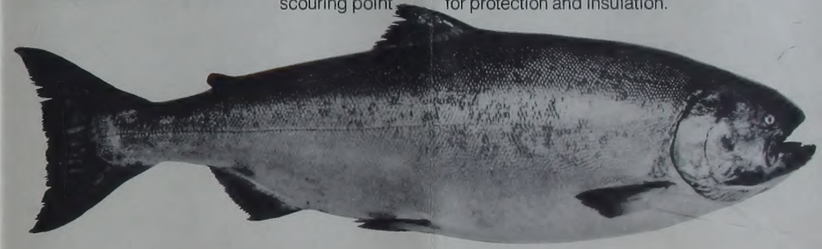
The Institute of Marine Science at the University of Alaska was commissioned to make a basic biological and physical study of the harbor at Valdez to provide information of flushing rates, oil biodegradation, currents, diffusion, primary productivity and oil toxicology.

Archaeological studies have located about 200 sites along the route, most of them small camps used by transient hunters and trappers. The largest was in Atigun Canyon—a dozen moss houses with artifacts, including a drum ring, handles and trade beads. The sites were excavated by the University of Alaska and Alaska Methodist University before construction began.



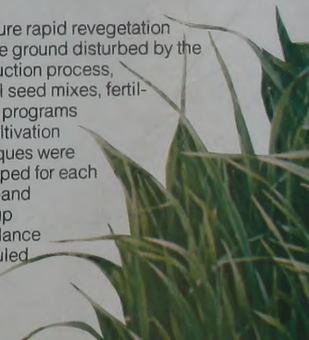
The pipe specified for the trans Alaska line was designed to meet the environmental challenges. It's four feet in diameter and used in two wall thicknesses—.462 and .562 inches. The pipe is produced in three grades to meet varying stresses and minimum yield strengths (wrinkling under stress) are 60,000, 65,000 and 70,000 pounds per square inch.

Special studies in advance of construction identified fish spawning streams so that the line crossings could be made without disrupting aquatic life. Where the line is buried under streams, it is jacketed with concrete and buried several feet below the deepest probable scouring point for protection and insulation.



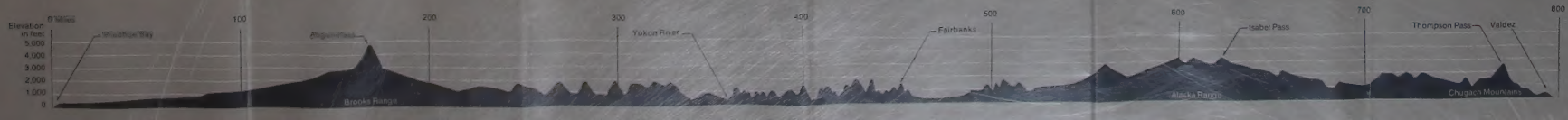
As part of the program to achieve rapid regeneration of the land after construction, technologists secured 15,000 random soil samples along the route, then classified them into 826 composite samples which were then subjected to a variety of tests.

To assure rapid revegetation over the ground disturbed by the construction process, special seed mixes, fertilization programs and cultivation techniques were developed for each area—and followup surveillance scheduled.



the trans Alaska pipeline

The builders of the pipeline know both the beauty and the challenges of this great country. The line starts at Prudhoe Bay in an arctic desert where the average annual rainfall is about six inches—less than the Great Basin Desert of Nevada and Utah receives. From the North Slope the line climbs to 4800 feet over Atigun Pass in the spectacularly beautiful Brooks Range. It then descends to cross the Yukon on the first all-weather bridge ever built over that famous river. From there the line climbs again—3300 feet over the Alaska Range. Another drop, and then another climb to Thompson Pass in the Chugach Mountains before the final descent to sea level at the ice-free Port of Valdez.



BY WAY OF EXPLANATION - We continue to receive requests for this brochure, which, although it was printed in 1975, remains one of the most popular information pamphlets about the trans Alaska pipeline. In order that we may continue to make the brochure available on request, while also assuring that the information we distribute is timely and accurate, we have prepared the following updated summary of the status of the pipeline.

Should the unfolded brochure be hung as a poster, it may be useful to attach this envelope for the information of others.

Construction of the $8 billion trans Alaska pipeline was completed in mid-1977, and the first tanker carried a cargo of North Slope crude oil from the Valdez Terminal on August 1, 1977. In those first months of operation, oil flow was held to about 700,000 barrels per day. But as the system was proved, and as North Slope producers increased their output, the trans Alaska pipeline was modified to transport the quantities of oil available. In October 1978, the flow reached 1.2 million barrels daily, and by the end of 1979 had increased to above 1.5 million.

Crude oil reaches the pipeline at a temperature of 145 degrees Fahrenheit. Although pumping and friction with the pipe walls create additional heat, the effect of Alaska's environment is greater, and oil reaches the Valdez Terminal at a temperature of about 75 degrees Fahrenheit.

At the 1.5 million-barrel throughput level, oil is moving at about 5.6 miles per hour, requiring just under six days to travel from Prudhoe Bay to Valdez. By the end of 1980, 10 pump stations will be in operation on the line. All but two are equipped with three pumps, two in operation and one on standby. Only two pumps will be installed at Stations 2 and 7. One of the pumps at Station 2 is designed to allow rapid relocation to another station site, should that become necessary.

Alyeska pipeline
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1835 South Bragaw St. Anchorage, AK 99512